

OBESITY AND ITS ASSOCIATION WITH OTHER CARDIOVASCULAR RISK FACTORS IN WOMEN IN CENTRAL IRAN - WOMEN'S HEALTHY HEART PROJECT

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Abstract

INTRODUCTION: Cardiovascular diseases (CVD) are considered the most important cause of death worldwide. Obesity is a major CVD risk factor. This study was conducted to evaluate the prevalence of obesity and its association with other CVD risk factors in Iranian women.

METHODS: This cross-sectional study was conducted in 2001 as part of Isfahan Healthy Heart Program (IHHP) in three Central Iranian cities of Isfahan, Najaf-Abad and Arak. Being over 19 years of age, absence of pregnancy, absence of mental retardation and Iranian nationality were the criteria for inclusion in the study. A questionnaire on demographics characteristics, drug consumption, smoking status, and physical activity were filled out for every subject. Height, weight and blood pressure of all subjects were measured and fasting blood samples were taken to measure blood glucose and lipids. The data were analyzed with T-test, χ^2 and multiple linear regression, using SPSS11.

RESULTS: Of 6391 women aged 38.8 ± 14.5 years participating in the study, 79% lived in the urban areas and 21% in the rural areas. The prevalence of a higher BMI was greater in urban areas in all ages. Hypertension, diabetes, total cholesterol-triglyceride and LDL-C disorders and inadequate physical activity were more prevalent in obese women than normal ones, but no significant difference was seen in HDL-C disorder and smoking between the two groups ($P < 0.05$).

There was a significant positive relationship between BMI and age, blood glucose and urban residence, and a negative relationship was observed between BMI and inadequate physical activity ($P < 0.05$).

DISCUSSION: The high prevalence of obesity and the major risk factors of cardiovascular diseases in urban areas is testament to unhealthy lifestyle and insufficient physical activity of women in areas studied.

Keywords • Women • Obesity • Residence • Risk factor

ARYA Journal, 2005, 1(2): 75-79

Introduction

The high prevalence of obesity in developing nations, Asian countries in particular, is due to economic, technological and social changes which have occurred in the past few decades.¹ In 1997, the World Health Organization (WHO) introduced obesity in women as one of the major health problems in many countries.²

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Obesity, a consequence of increased fat accumulation in the adipose tissues, is considered a common and dangerous problem throughout the world and is known as one of the major risk factors of coronary artery diseases.

Moreover, it is directly associated with hypertension, dyslipidemia, stroke and diabetes.³⁻⁴

An unhealthy lifestyle (insufficient physical activity and unhealthy diet) has resulted in a high prevalence of obesity in Iran. In view of the significance of the problem, this study was carried out to assess the current status of Iranian women in respect of cardiovascular disease (CVD) risk factors, obesity in particular.

Materials and methods

This cross-sectional study was conducted in 2001 on women in the three Central Iranian cities of Isfahan, Najaf-Abad and Arak as part of the first phase of Isfahan Healthy Heart Program (IHHP) within the framework of Women's Healthy Heart Project (WHHP).⁵ Iranian nationality, absence of mental retardation, absence of pregnancy, over 19 years of age were the criteria of inclusion in the study. Stratified cluster sampling was conducted in the urban and rural areas of the three cities. The ratio of urban to rural population was calculated given the figures corresponding to the total population of these cities. In the beginning of the study, the participating women filled out questionnaires obtaining data on demographic characteristics, medications, physical activity and smoking status. The weight of the individuals undergoing this study was measured using standard Seca® scales, while wearing light clothes and no shoes. The subjects' heights were also recorded and body mass index (BMI) was calculated. Blood samples were taken from the subjects after 12-14 hours of fasting to measure blood sugar (BS), total cholesterol (TC), triglyceride (TG), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C). The blood samples were studied with an enzymatic method using an ELAN 2000 autoanalyzer at Isfahan Cardiovascular Research Center Laboratory. In cases of TG < 400 mg/dl, LDL-C was measured with the Friedwald formula.⁶

Blood pressure was measured on the right arm with a standard sphygmomanometer after 15 minutes in resting state in sitting position (according to WHO protocol). The average of two readings was recorded. Subjects with systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, or those on antihypertensive medication were considered as hypertensive.⁷ Individuals whose fasting blood sugar exceeded 126 mg/dl or those on antidiabetic medication were considered as diabetic.⁸ Individuals smoking any number of cigarettes per day during the study were considered as smokers.⁹ Subjects with TC and/or TG levels ≥ 200mg/dl, LDL-C ≥ 130 mg/dl, and/or HDL-C < 35 mg/dl were considered as dyslipidemic.¹⁰⁻¹¹ Less than 30 minutes of physical activity at least twice a week was considered as insufficient physical activity.¹² BMI of 25-29.9 kg/m², >30kg/m², and >40kg/m² were considered as overweight, obesity, and morbid obesity, respectively.¹³ All data were analyzed with SPSS11 using student t-test, Yata corrected χ² and multiple linear regression.

Results

A total of 6391 women with a mean age of 38.8±14.5 years in three cities of Isfahan, Najaf-Abad and Arak were studied. Of this number, 79% resided in urban areas and 21% in rural areas. Table 1 shows the distribution of women in the study based on BMI. Abnormal BMI was found to be more prevalent in urban areas than in rural areas.

TABLE 1. Distribution of women based on BMI

Body Mass Index	Urban area Number (percent)	Rural area Number(percent)
< 25 kg/m ²	1643 (36.6)	832 (48.5)
25-29 kg/m ²	1604 (35.7)	568 (33.1)
30-39 kg/m ²	1125 (25)	271 (15.8)
≥40 kg/m ²	84 (1.9)	25 (1.5)

TABLE 2. Mean ± Standard deviation of BMI of women based on age and area of residence

Age group	Urban area Mean ± SD	Rural area Mean ± SD	P
20-29	24.87±5.71	23.71±4.77	0.00
30-39	27.57±46.5	25.99±5.31	0.00
40-49	28.77±5.2	27.87±7.39	0.02
50-59	29.00±5.49	27.5±6.52	0.04
≥60	28.07±6.12	26.36±6.30	0.001

P < 0.05: significant

TABLE 3. Comparison of the prevalence of risk factors between obese and normal-weight women based on area of residence

Risk factor	Urban area		P	Rural area		P
	BMI<25	BMI≥25		BMI<25	BMI≥25	
High blood pressure	9.5%	24%	0.00	14.4%	26.8%	0.00
Diabetes	3.3%	7%	0.00	2.5%	7.5%	0.00
Low HDL-C	7.3%	8.3%	0.13	5.9%	6%	0.05
High LDL-C	27.4%	45.6%	0.00	37.5%	51.4%	0.00
Smoking	1.7%	2.3%	0.08	0.4%	0.6%	0.39
Hypertriglyceridemia	12.4%	33.4%	0.00	12.4%	34.1%	0.00
Hypercholesterolemia	32.8%	56.7%	0.00	61.3%	41.5%	0.00
Insufficient physical activity	71%	72.4%	0.831	83.6%	86.6%	0.63

P < 0.05: significant

TABLE 4. Comparison of the mean and standard deviation of risk factors between obese and non-obese women based on residence area

Risk factor	Urban area		P	Rural area		P
	BMI<25	BMI≥25		BMI<25	BMI≥25	
Systolic blood pressure	106.42±14.66	114.5±16.80	0.00	110.54±64.17	116.48±17.89	0.00
Diastolic blood pressure	70.51±9.76	75.35±10.49	0.00	72.87±10.39	76.75±10.15	0.00
Fasting blood sugar	78.23±24.07	83.87±34.03	0.00	79.92±17.95	84.64±32.83	0.00
HDL-C	49.02±13.74	47.60±12.31	0.001	49.82±15.88	49.38±14.32	0.55
LDL-C	109.17±38.42	128.27±14.22	0.00	122.35±341.69	132.91±43.03	0.00
Total cholesterol	184.47±4.81	212.74±52.90	0.00	196.49±46.14	216.38±51.93	0.00
Serum triglyceride	131.40±84.18	184.84±107.08	0.00	130.66±74.43	713.89±104.89	0.00

TABLE 5. Relationship between BMI and CVD risk factors

Risk factors	B*	P
Age	0.18	0.00
Smoking	0.02	0.97
Insufficient physical activity	-0.01	0.03
Blood sugar	0.06	0.00
Region of urban residence	-0.09	0.00

*Regression index in this table indicates the type of relation between the variables, so that negative figures indicate an inverse relationship between two variables

The mean and standard deviation of BMI in different age groups based on area of residence is shown in table 2; it can be seen that in any age group figures in urban areas are higher than in rural areas (P<0.05).

Table 3 shows the prevalence of risk factors based on body mass index in urban and rural areas; it can be seen that all risk factors, except low HDL-C and smoking are more prevalent in obese women than in women with a normal BMI (P<0.05).

Comparison of mean and standard deviation of lipids, blood glucose and blood pressure in obese and non-obese women shows that the mentioned variables have significantly higher values in obese women (P<0.05), but in terms of HDL-C, there was no statistically significant difference between the two groups in rural areas (table 4).

As seen in table 5, there is a significant positive relationship between BMI and age, blood glucose and area of residence in urban areas, and a significant negative relationship between BMI and insufficient physical activity (P<0.05); however, this relationship did not exist between BMI and smoking (P>0.05).

Discussion

In this study, 33.3% of the women were overweight and 23.4% were obese. According to a Saudi Arabian study of individuals aged between 18 and 48 years, 65.4% of the women were obese and BMI increased with aging, but decreased in women over 60 years of age in urban areas and over 50 in rural areas. Moreover, the number of individuals with BMI>30

was less than those with BMI>25; a similar trend is seen other countries, including Iran.¹⁴

The decrease in obesity at older ages in women of both areas can be accounted for by low energy intake in these ages and in view of the higher prevalence in higher ages of non-communicable diseases such as hypertension, diabetes and vascular diseases, which usually mandates limitations in the intake of fatty foods and carbohydrates, which in turn results in decreased prevalence of obesity. Moreover, many morbidly obese women died before old age.¹⁵

In a study conducted in Bahrain, 32% of women were obese, although a study conducted in the littoral Persian Gulf states found the prevalence of obesity in Bahrain to be higher than in others. The prevalence of obesity in Bahrain was of course similar to that of the United Arab Emirates and Kuwait.¹⁶⁻¹⁸

In a Hong Kong study, the prevalence of obesity in women was 30.5%.¹⁹ The prevalence of obesity in Spain and Turkey was 23.7% and 27.4%, respectively. In Palestine, the prevalence of obesity in urban and rural areas was 49.1% and 36.8%, respectively.

Our results were similar to those of a Pakistani study, which found the prevalence of obesity in urban areas to be greater than in rural areas.²⁰⁻²³ Comparison of the prevalence of hypertension between obese and non-obese women shows higher blood pressure levels in obese women.

The direct relationship between the prevalence of hypertension and degree of obesity has been described in previous studies. Obesity has an undesirable effect on the state of blood pressure, which can be attributed to increased peripheral vascular resistance and increased cardiac output.²⁴

As in other studies, a significant relationship was seen between TC levels and obesity, which is due to a rise in cholesterol production with increased weight.²⁴

No clear relationship was seen between HDL-C and BMI in obese and non-obese women in urban and rural areas; this may be explained by the fact that physical activity is the most effective factor on HDL-C, and that physical activity levels were insufficient in both urban and rural areas. TC, TG and LDL-C disorders were more prevalent in obese women than in non-obese women.

The results of this study were similar to those of others, including one conducted in Canada.²⁵

As demonstrated by other studies, diabetes in human is in constant relationship with obesity.

The prevalence of diabetes is in direct relationship with age and degree of obesity.

Insulin resistance which plays a major role in non-insulin dependant diabetes increases with obesity;

hence, obesity may be held to account for the higher prevalence of diabetes in obese individuals.²⁶

Culturally, smoking in the public is considered an inapt behavior in Iran and women constituted a small percentage of smokers.

No relationship was observed between obesity and smoking in this study. A study conducted in Isfahan ascertained that energy intake disorder is not the sole cause of obesity in the Iranian society. Another study found that the main cause of obesity in the Iranian population is lack of adequate physical activity.²⁷

This study showed an association between obesity and other CVD risk factors; thus encouraging greater physical activity and adoption of healthier diets (limiting intake of high-calorie foods and fast foods) is recommended as an indispensable component of any interventional strategy to curb the rising tide and burden of cardiovascular diseases in the Iranian society.

References

1. Carroll D, Gardner P, Kay BA, et al. Transformation of the developing world:socioeconomic matrix. *Emerg Infect Dis* 2004;10(11):2049-54.
2. Yamori Y. Worldwide epidemic of obesity. *Clin Exp Pharmacol Physiol* 2004;31(2):S2-4.
3. Ghassemi H, Harrison G, Mohammad K. An accelerated nutrition transition in Iran. *Public health Nutr* 2002;5(1A):149-55.
4. Pogorelov D, Lazarenko AI, Khuratora BG. Overweight an actual problem in modern world. *Vopr Pitan* 2003;72(6):36-9.
5. Sarraf-Zadegan N, Sadry Gh, Malek Afzali H, Baghai M, Mohammadifard N, Shahrokhy Sh, et al. Isfahan Healthy Heart Program: A Comprehensive Integrated Community-based Program for Cardiovascular Disease Prevention and Control. *Acta Cardiologica* 2003;58(4):309-20.
6. Friedewald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. *Clinical Chemistry* 1972;18:499-502.
7. Lenfant CE, Chobanian AV, Jones DW, Rocella EJ. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC VII). *Circ* 2003;107(24):2993-4.
8. Heller GV. Evaluation of the patient with diabetes mellitus and suspected coronary artery disease. *Am J Med* 2005;118:9S-14S.

9. World Health Organization. Tobacco or health: a global status report. Geneva: World Health Organization;1997.
10. Brewer HB. New feature of the national cholesterol education program adult treatment panel III lipid lowering guideline. *Clin Cardiol* 2003;26(4):III19-24.
11. Muratsubaki H, Enomoto K, Ichijoh Y, Yamamoto Y. Familial hypertriglyceridemia and diabetes mellitus type 2. *Gac Med Mex* 2005;141(3):201-5.
12. Cavill N, Biddle S, Sallis JF. Health enhancing physical activity for young people: statement of the United Kingdom expert consensus conference. *Pediatr Exerc Sci* 2001;13:12-25.
13. National Institutes of Health, National Heart, Lung and Blood Institute. Clinical guideline on the identification, evaluation and treatment of overweight and obesity in adults:the evidence report. Rockville, MD:National Institutes of Health, National Heart, Lung and Blood Institute;1998:1-228.
14. Al-Nozha MM, Al-Mazrou YY, Al-Maotouq MA, et al. Obesity in Saudi Arabia. *Saudi Med J* 2005;26(5):824-9.
15. Mohamadifard N, Jalali A, Rafiee M. Food and nutrient intake among adults of Isfahan. *South Asian J of Preventive Cardiology* 1998;2:56-64.
16. Al-Mahroos F, Al-Roomi Kh. Obesity among adult Bahraini population. *Ann Sau Med* 2001;(21):183-7.
17. Al-Isa AN. Changes in body mass index and prevalence of obesity among Kuwaitis 1980-1994. *Int J Obes Relat Metab Disord* 1997;21:1093-9.
18. El-Mugamer IT, Ali Zayat AS, Hossain MM, Pugh RN. Diabetes, obesity and hypertension in urban and rural people of Bedouin origin in the United Arab Emirates. *J Trop Med Hyg* 1995;98:407-15.
19. Ko GT, Wu MM, Tang J, Wai HP, Chan CH, Chen R. Body mass index profile in Hong Kong Chinese adults. *Ann Acad Med Singapore* 2001;30(4):393-6.
20. Nanan DJ. The obesity pandemic implications for Pakistan. *J Pak Med Assoc* 2002;52(8):342-6.
21. Erem C, Yildiz R, Kavgaci H, Karahan C, Deger O, Can G, Telatar M. Prevalence of diabetes, obesity and hypertension in a Turkish population (Trabzon city). *Diab Res Clin Pract* 2001;54(3):203-8.
22. Martinez-Ros MT, Tormo MJ, Navarro C, Chirlaque MD, Perez-Flores D. Extremely high prevalence of overweight and obesity in Murcia, a Mediterranean region in south-east Spain. *Int J Obes Relat Metab Disord* 2001;25(9):1372-80.
23. Abdul-Rahim HF, Holmboe-Ottesen G, Stene LC, Husseini A, Giacaman R, Jervell J, Bjertness E. Obesity in a rural and an urban Palestinian West Bank population. *Int J Obes Relat Metab Disord* 2003;27(1):140-6.
24. Winterfeld A. Treating obesity. *NCSL Legisbrief* 2005;13(22):1-2.
25. LCDRC, Health Canada, Number of cardiovascular disease deaths by sex, actual and projected Canada, 1950-2016. Cited in Health and stroke Foundation of Canada, 2000. The changing face of heart disease and stroke in Canada 1999.
26. Boyer BB, Mohatt GV, Lardon C, Plaetke R, et al. Building a community-based participatory research center to investigate obesity and diabetes in Alaska natives. *Int J Circumpolar Health* 2005;64(3):281-90.
27. Boshtam M, Rafiei M, Sarraf-Zadegan N. Obesity and associated cardiovascular risk factor in Isfahan population: Isfahan Cardiovascular Risk Factor survey. *Atherosclerosis* 1997;1(4):7-11.